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NATIONAL BUREAU OF STANDARDS REPORT

1896

THE COMPLETE SOLUTIONS OF THE
BALANCED INCOMPLETE BLOCK DESIGNS
WITH TEN OR FEWER REPLICATIONS

by

Mellicent K. Rupp

with an introduction by

W. S. Connor



U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

U. S. DEPARTMENT OF COMMERCE

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NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT

NBS REPORT

3737-60-0002

29 August 1952

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Statistical Engineering Laboratory
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FOREWORD

This report was prepared as part of a continuing program of research on mathematical statistics and its applications carried out at the National Bureau of Standards under the general supervision of Dr. Churchill Eisenhart, Chief of the Statistical Engineering Laboratory. The Statistical Engineering Laboratory is Section 11.3 of the National Applied Mathematics Laboratories (Division 11, National Bureau of Standards), and is concerned with the development and application of modern statistical methods in the physical sciences and engineering.

J. H. Curtiss
Chief, National Applied
Mathematics Laboratories

A. V. Astin
Director
National Bureau of Standards

INTRODUCTION

by

W. S. Connor

In the balanced incomplete block design v varieties or treatments are compared in such a manner that each treatment is assigned to r experimental units. The units themselves are arranged into b more or less homogeneous blocks, each containing k experimental units. Any two treatments occur together in the same block λ times, the treatments occurring in a given block being all different. Hence the design depends on the five parameters, v , b , r , k , and λ . From this definition it is easy to show that the following conditions are necessary:

$$bk = vr, r(k-1) = (v-1)\lambda.$$

Fisher [1] also showed that for the existence of an actual combinatorial solution it is necessary that

$$b \geq v, \text{ or } k \leq r.$$

The work of Yates [2], Fisher and Yates [3], Bose [4], and Bhattacharya [5], [6], [7], provided solutions for many of these designs. Sets of parameters which satisfy the above conditions, together with brief explanations of how to construct the corresponding designs, are included in Fisher and Yates' tables [8]. All of these sets have $r \leq 10$, which is felt to be a practical upper limit.

The purpose of this report is to write out in full the solutions for the designs which are listed by Fisher and Yates. It is believed that making the designs more accessible will increase their usefulness.

Every solution occupies one or more pages. The reference number and parameters of the design are given at the top of the page, followed in some cases by descriptive remarks, and then by the solution. Treatments are denoted by Arabic numbers, blocks by Arabic numbers in parentheses, and replications by Roman numbers.

The index gives the reference number,* parameters, and important characteristics of each design. These characteristics

*No solution is known for those sets of parameters which do not carry a reference number. All but two of these designs have been proved impossible.

are abbreviated in a "Remarks" column. The abbreviations have the following meanings: "R" denotes "resolvable", which means that the blocks are divisible into groups, which have the property that every treatment occurs once in a group: " $i_1 G : i_2$ "; where i_1 and i_2 are positive integers, means that the blocks have been divided into i_1 groups, each of which contains every treatment i_2 times.

"Y.S." denotes "Youden Square", which means that the treatments have been arranged so that each column contains every treatment exactly once. This kind of arrangement is always possible when $b = v$. The first Youden Squares were given in [9]. "E.Y.S." denotes "extended Youden Square", and means that each column contains every treatment i_3 times, where i_3 is a positive integer, greater than one.

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1.	k	b	v	r	1
	2	6	4	3	1

3 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>
I	(1)	1 2
	(2)	3 4
II	(3)	1 3
	(4)	2 4
III	(5)	1 4
	(6)	2 3

2.	k	b	v	r	λ
	2	10	5	4	1

2 groups; each contains 2 replications;
extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	
I	(1)	1	2
	(2)	2	5
	(3)	3	4
	(4)	4	1
	(5)	5	3
II	(6)	1	3
	(7)	2	4
	(8)	3	2
	(9)	4	5
	(10)	5	1

3.	k	b	v	r	λ
	2	15	6	5	1

5 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	
I	(1)	1	2
	(2)	4	6
	(3)	3	5
II	(4)	1	3
	(5)	2	6
	(6)	4	5
III	(7)	1	4
	(8)	2	3
	(9)	5	6
IV	(10)	1	5
	(11)	2	4
	(12)	3	6
V	(13)	1	6
	(14)	2	5
	(15)	3	4

4.	k	b	v	r	λ
	2	21	7	6	1

3 groups; each contains 2 replications;
extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	
I	(1)	1	2
	(2)	2	6
	(3)	3	4
	(4)	4	7
	(5)	5	1
	(6)	6	5
	(7)	7	3
II	(8)	1	3
	(9)	2	4
	(10)	3	5
	(11)	4	6
	(12)	5	7
	(13)	6	1
	(14)	7	2
III	(15)	1	4
	(16)	2	3
	(17)	3	6
	(18)	4	5
	(19)	5	2
	(20)	6	7
	(21)	7	1

5. k b v r λ
 2 28 8 7 1

7 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>		<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	
I	(1)	1	2	V	(17)	1	6
	(2)	3	4		(18)	2	5
	(3)	5	8		(19)	3	8
	(4)	6	7		(20)	4	7
II	(5)	1	3	VI	(21)	1	7
	(6)	2	8		(22)	2	6
	(7)	4	6		(23)	3	5
	(8)	5	7		(24)	4	8
III	(9)	1	4	VII	(25)	1	8
	(10)	2	3		(26)	2	7
	(11)	5	6		(27)	3	6
	(12)	7	8		(28)	4	5
IV	(13)	1	5				
	(14)	2	4				
	(15)	3	7				
	(16)	6	8				

6. k b v r λ
 2 36 9 8 1

4 groups; each contains 2 replications;
 Extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>		<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	
I	(1)	1	2	III	(19)	1	4
	(2)	2	8		(20)	2	6
	(3)	3	4		(21)	3	2
	(4)	4	7		(22)	4	5
	(5)	5	6		(23)	5	7
	(6)	6	1		(24)	6	8
	(7)	7	3		(25)	7	9
	(8)	8	9		(26)	8	1
	(9)	9	5		(27)	9	3
II	(10)	1	3	IV	(28)	1	5
	(11)	2	5		(29)	2	4
	(12)	3	6		(30)	3	8
	(13)	4	9		(31)	4	6
	(14)	5	8		(32)	5	3
	(15)	6	7		(33)	6	9
	(16)	7	1		(34)	7	2
	(17)	8	4		(35)	8	7
	(18)	9	2		(36)	9	1

7. k b v r λ
 2 45 10 9 1

9 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>
I	(1)	1 2	IV	(16)	1 5
	(2)	3 4		(17)	2 4
	(3)	5 7		(18)	3 9
	(4)	6 10		(19)	7 10
	(5)	8 9		(20)	6 8
II	(6)	1 3	V	(21)	1 6
	(7)	2 10		(22)	2 5
	(8)	4 5		(23)	3 10
	(9)	7 8		(24)	4 8
	(10)	6 9		(25)	7 9
III	(11)	1 4	VI	(26)	1 7
	(12)	2 3		(27)	2 6
	(13)	5 8		(28)	3 5
	(14)	6 7		(29)	4 9
	(15)	9 10		(30)	8 10

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>
VII	(31)	1 8
	(32)	2 7
	(33)	3 6
	(34)	4 10
	(35)	5 9
VIII	(36)	1 9
	(37)	2 8
	(38)	3 7
	(39)	4 6
	(40)	5 10
IX	(41)	1 10
	(42)	2 9
	(43)	3 8
	(44)	4 7
	(45)	5 6

8. k b v r λ
 2 55 11 10 1

5 groups; each contains 2 replications;
 Extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>
I	(1)	1 2	III	(23)	1 4
	(2)	2 11		(24)	2 3
	(3)	3 10		(25)	3 7
	(4)	4 5		(26)	4 6
	(5)	5 6		(27)	5 10
	(6)	6 7		(28)	6 9
	(7)	7 1		(29)	7 11
	(8)	8 3		(30)	8 2
	(9)	9 4		(31)	9 1
	(10)	10 9		(32)	10 8
	(11)	11 8		(33)	11 5
II	(12)	1 3	IV	(34)	1 5
	(13)	2 6		(35)	2 9
	(14)	3 5		(36)	3 6
	(15)	4 10		(37)	4 2
	(16)	5 9		(38)	5 7
	(17)	6 8		(39)	6 10
	(18)	7 2		(40)	7 8
	(19)	8 1		(41)	8 4
	(20)	9 7		(42)	9 11
	(21)	10 11		(43)	10 1
	(22)	11 4		(44)	11 3

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>
V	(45)	1 6
	(46)	2 5
	(47)	3 4
	(48)	4 7
	(49)	5 8
	(50)	6 11
	(51)	7 10
	(52)	8 9
	(53)	9 3
	(54)	10 2
	(55)	11 1

9. k b v r λ
 3 4 4 3 2

Youden Square

<u>Block</u>	<u>Treatment</u>		
(1)	1	2	3
(2)	2	3	4
(3)	3	4	1
(4)	4	1	2

10. k b v r λ
 3 7 7 3 1

Youden Square

<u>Block</u>	<u>Treatment</u>		
(1)	1	3	6
(2)	2	1	5
(3)	3	7	2
(4)	4	5	3
(5)	5	6	7
(6)	6	2	4
(7)	7	4	1

11.	k	b	v	r	λ
	3	10	5	6	3

2 groups; each contains 3 replications;
Extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>		
I	(1)	1	2	3
	(2)	2	1	5
	(3)	3	4	2
	(4)	4	5	1
	(5)	5	3	4
II	(6)	1	2	4
	(7)	2	3	5
	(8)	3	4	1
	(9)	4	5	2
	(10)	5	1	3

12.	k	b	v	r	λ
	3	10	6	5	2

<u>Block</u>	<u>Treatment</u>		
(1)	1	4	5
(2)	2	4	6
(3)	3	4	5
(4)	5	6	1
(5)	5	6	2
(6)	6	1	3
(7)	4	1	2
(8)	1	2	3
(9)	5	2	3
(10)	6	3	4

13. k b v r λ
 3 12 9 4 1

4 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>		
I	(1)	1	2	3
	(2)	4	5	6
	(3)	7	8	9
II	(4)	1	4	7
	(5)	2	5	8
	(6)	3	6	9
III	(7)	1	6	8
	(8)	2	4	9
	(9)	3	5	7
IV	(10)	1	5	9
	(11)	2	6	7
	(12)	3	4	8

14.	k	b	v	r	λ
	3	26	13	6	1

2 groups; each contains 3 replications;
Extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>		
I	(1)	1	3	9
	(2)	2	4	10
	(3)	3	5	11
	(4)	4	6	12
	(5)	5	7	13
	(6)	6	8	1
	(7)	7	9	2
	(8)	8	10	3
	(9)	9	11	4
	(10)	10	12	5
	(11)	11	13	6
	(12)	12	1	7
	(13)	13	2	8
II	(14)	2	6	5
	(15)	3	7	6
	(16)	4	8	7
	(17)	5	9	8
	(18)	6	10	9
	(19)	7	11	10
	(20)	8	12	11
	(21)	9	13	12
	(22)	10	1	13
	(23)	11	2	1
	(24)	12	3	2
	(25)	13	4	3
	(26)	1	5	4

15. k b v r λ
 3 30 10 9 2

3 groups; each contains 3 replications;
 Extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>		
I	(1)	1	2	3
	(2)	2	5	8
	(3)	3	7	4
	(4)	4	1	6
	(5)	5	8	7
	(6)	6	4	9
	(7)	7	9	1
	(8)	8	10	2
	(9)	9	3	10
	(10)	10	6	5
II	(11)	1	2	4
	(12)	2	3	6
	(13)	3	4	8
	(14)	4	9	5
	(15)	5	7	1
	(16)	6	8	9
	(17)	7	10	3
	(18)	8	1	10
	(19)	9	5	2
	(20)	10	6	7
III	(21)	1	3	5
	(22)	2	7	6
	(23)	3	8	9
	(24)	4	2	10
	(25)	5	6	3
	(26)	6	1	8
	(27)	7	9	2
	(28)	8	4	7
	(29)	9	10	1
	(30)	10	5	4

16. k b v r λ
 3 35 15 7 1

7 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>		
I	(1)	1	2	3	V	(21)	1	10	11
	(2)	4	8	12		(22)	2	12	14
	(3)	5	10	15		(23)	3	5	6
	(4)	6	11	13		(24)	4	9	13
	(5)	7	9	14		(25)	7	8	15
II	(6)	1	4	5	VI	(26)	1	12	13
	(7)	2	8	10		(27)	2	5	7
	(8)	3	13	14		(28)	3	9	10
	(9)	6	9	15		(29)	4	11	15
	(10)	7	11	12		(30)	6	8	14
III	(11)	1	6	7	VII	(31)	1	14	15
	(12)	2	9	11		(32)	2	4	6
	(13)	3	12	15		(33)	3	8	11
	(14)	4	10	14		(34)	5	9	12
	(15)	5	8	13		(35)	7	10	13
IV	(16)	1	8	9					
	(17)	2	13	15					
	(18)	3	4	7					
	(19)	5	11	14					
	(20)	6	10	12					

17. k b v r λ

 3 57 19 9 1

3 groups; each contains 3 replications;
Extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			
I	(1)	1	7	11	(39)	4	6	9
	(2)	2	8	12	(40)	5	7	10
	(3)	3	9	13	(41)	6	8	11
	(4)	4	10	14	(42)	7	9	12
	(5)	5	11	15	(43)	8	10	13
	(6)	6	12	16	(44)	9	11	14
	(7)	7	13	17	(45)	10	12	15
	(8)	8	14	18	(46)	11	13	16
	(9)	9	15	19	(47)	12	14	17
	(10)	10	16	1	(48)	13	15	18
	(11)	11	17	2	(49)	14	16	19
	(12)	12	18	3	(50)	15	17	1
	(13)	13	19	4	(51)	16	18	2
	(14)	14	1	5	(52)	17	19	3
	(15)	15	2	6	(53)	18	1	4
	(16)	16	3	7	(54)	19	2	5
	(17)	17	4	8	(55)	1	3	6
	(18)	18	5	9	(56)	2	4	7
	(19)	19	6	10	(57)	3	5	8
II	(20)	2	3	14				
	(21)	3	4	15				
	(22)	4	5	16				
	(23)	5	6	17				
	(24)	6	7	18				
	(25)	7	8	19				
	(26)	8	9	1				
	(27)	9	10	2				
	(28)	10	11	3				
	(29)	11	12	4				
	(30)	12	13	5				
	(31)	13	14	6				
	(32)	14	15	7				
	(33)	15	16	8				
	(34)	16	17	9				
	(35)	17	18	10				
	(36)	18	19	11				
	(37)	19	1	12				
	(38)	1	2	13				
				III				

18. k b v r λ
 3 70 21 10 1

10 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>		
I	(1)	1	2	3	VI	(36)	1	8	10
	(2)	4	5	6		(37)	2	18	19
	(3)	7	8	9		(38)	3	15	17
	(4)	10	11	12		(39)	4	12	16
	(5)	13	14	15		(40)	5	9	21
	(6)	16	17	18		(41)	6	11	14
	(7)	19	20	21		(42)	7	13	20
II	(8)	1	4	15	VII	(43)	1	11	18
	(9)	2	5	11		(44)	2	10	20
	(10)	3	9	16		(45)	3	5	12
	(11)	6	17	20		(46)	4	9	13
	(12)	7	12	19		(47)	6	16	21
	(13)	8	13	18		(48)	7	14	17
	(14)	10	14	21		(49)	8	15	19
III	(15)	1	5	17	VIII	(50)	1	12	20
	(16)	2	4	14		(51)	2	6	8
	(17)	3	7	11		(52)	3	14	19
	(18)	6	10	19		(53)	4	18	21
	(19)	8	16	20		(54)	5	7	15
	(20)	9	15	18		(55)	9	10	17
	(21)	12	13	21		(56)	11	13	16
IV	(22)	1	6	9	IX	(57)	1	13	19
	(23)	2	7	16		(58)	2	9	12
	(24)	3	8	21		(59)	3	4	20
	(25)	4	17	19		(60)	5	8	14
	(26)	5	10	13		(61)	6	7	18
	(27)	11	15	20		(62)	10	15	16
	(28)	12	14	18		(63)	11	17	21
V	(29)	1	7	21	X	(64)	1	14	16
	(30)	2	13	17		(65)	2	15	21
	(31)	3	10	18		(66)	3	6	13
	(32)	4	8	11		(67)	4	7	10
	(33)	5	16	19		(68)	5	18	20
	(34)	6	12	15		(69)	8	12	17
	(35)	9	14	20		(70)	9	11	19

19. k b v r λ
 4 5 5 4 3

Youden Square

<u>Blk.</u>	<u>Tr.</u>			
(1)	1	2	3	4
(2)	2	3	4	5
(3)	3	4	5	1
(4)	4	5	1	2
(5)	5	1	2	3

20. k b v r λ
 4 7 7 4 2

Youden Square

<u>Blk.</u>	<u>Tr.</u>			
(1)	1	2	3	4
(2)	2	4	7	5
(3)	3	6	5	2
(4)	4	5	6	1
(5)	5	7	1	3
(6)	6	3	4	7
(7)	7	1	2	6

21.	k	b	v	r	λ
	4	13	13	4	1

Youden Square

<u>Blk.</u>	<u>Tr.</u>			
(1)	1	2	3	10
(2)	2	6	13	7
(3)	3	13	4	8
(4)	4	7	1	11
(5)	5	11	8	2
(6)	6	4	10	5
(7)	7	3	5	12
(8)	8	1	12	6
(9)	9	12	2	4
(10)	10	8	7	9
(11)	11	9	6	3
(12)	12	10	11	13
(13)	13	5	9	1

22. k b v r λ
 4 14 8 7 3

7 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			
I	(1)	1	2	3	4
	(2)	5	6	7	8
II	(3)	1	2	7	8
	(4)	3	4	5	6
III	(5)	1	3	6	8
	(6)	2	4	5	7
IV	(7)	1	4	6	7
	(8)	2	3	5	8
V	(9)	1	2	5	6
	(10)	3	4	7	8
VI	(11)	1	3	5	7
	(12)	2	4	6	8
VII	(13)	1	4	5	8
	(14)	2	3	6	7

23. k b v r λ
 4 15 6 10 6

5 groups;
 each contains 2 replications,
 which are separable.

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			
I	(1)	1	2	3	4
	(2)	3	4	5	6
	(3)	5	6	1	2
II	(4)	1	2	3	5
	(5)	3	4	1	6
	(6)	5	6	2	4
III	(7)	1	2	3	6
	(8)	3	4	2	5
	(9)	5	6	1	4
IV	(10)	1	2	4	5
	(11)	3	4	2	6
	(12)	5	6	1	3
V	(13)	1	2	4	6
	(14)	3	4	1	5
	(15)	5	6	2	3

24. k b v r λ
 4 15 10 6 2

<u>Blk.</u>			<u>Tr.</u>	
(1)	1	2	5	8
(2)	1	3	6	9
(3)	1	4	7	10
(4)	2	3	5	10
(5)	2	3	4	6
(6)	3	4	7	8
(7)	4	2	9	1
(8)	5	6	7	1
(9)	6	7	8	2
(10)	7	5	9	3
(11)	5	6	10	4
(12)	8	9	4	5
(13)	8	9	10	6
(14)	9	10	2	7
(15)	10	8	1	3

25. k b v r λ
 4 18 9 8 3

2 groups; each contains 4 replications;
 Extended Youden Square.

<u>Blk.</u>			<u>Tr.</u>	
(1)	1	4	6	7
(2)	2	6	8	9
(3)	3	8	9	1
(4)	4	1	3	2
(5)	5	7	1	8
(6)	6	9	4	5
(7)	7	3	2	6
(8)	8	2	5	4
(9)	9	5	7	3
(10)	1	2	5	7
(11)	2	3	6	5
(12)	3	4	7	9
(13)	4	9	2	1
(14)	5	1	9	6
(15)	6	8	1	3
(16)	7	6	4	8
(17)	8	5	3	4
(18)	9	7	8	2

26. k b v r λ
 4 20 16 5 1

5 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			
I	(1)	1	2	3	4
	(2)	5	6	7	8
	(3)	9	10	11	12
	(4)	13	14	15	16
II	(5)	1	5	9	13
	(6)	2	6	10	14
	(7)	3	7	11	15
	(8)	4	8	12	16
III	(9)	1	6	11	16
	(10)	2	5	12	15
	(11)	3	8	9	14
	(12)	4	7	10	13
IV	(13)	1	7	12	14
	(14)	2	8	11	13
	(15)	3	5	10	16
	(16)	4	6	9	15
V	(17)	1	8	10	15
	(18)	2	7	9	16
	(19)	3	6	12	13
	(20)	4	5	11	14

27. k b v r λ
 4 50 25 8 1

2 groups; each contains 4 replications
 Extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>				<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			
I	(1)	1	2	6	25	II	(26)	1	3	11	19
	(2)	2	3	7	21		(27)	2	4	12	20
	(3)	3	4	8	22		(28)	3	5	13	16
	(4)	4	5	9	23		(29)	4	1	14	17
	(5)	5	1	10	24		(30)	5	2	15	18
	(6)	6	7	11	5		(31)	6	8	16	24
	(7)	7	8	12	1		(32)	7	9	17	25
	(8)	8	9	13	2		(33)	8	10	18	21
	(9)	9	10	14	3		(34)	9	6	19	22
	(10)	10	6	15	4		(35)	10	7	20	23
	(11)	11	12	16	10		(36)	11	13	21	4
	(12)	12	13	17	6		(37)	12	14	22	5
	(13)	13	14	18	7		(38)	13	15	23	1
	(14)	14	15	19	8		(39)	14	11	24	2
	(15)	15	11	20	9		(40)	15	12	25	3
	(16)	16	17	21	15		(41)	16	18	1	9
	(17)	17	18	22	11		(42)	17	19	2	10
	(18)	18	19	23	12		(43)	18	20	3	6
	(19)	19	20	24	13		(44)	19	16	4	7
	(20)	20	16	25	14		(45)	20	17	5	8
	(21)	21	22	1	20		(46)	21	23	6	14
	(22)	22	23	2	16		(47)	22	24	7	15
	(23)	23	24	3	17		(48)	23	25	8	11
	(24)	24	25	4	18		(49)	24	21	9	12
	(25)	25	21	5	19		(50)	25	22	10	13

28. k b v r λ
 4 63 28 9 1

9 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>				<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			
I	(1)	1	3	23	26	V	(29)	1	6	12	13
	(2)	2	11	20	28		(30)	2	5	16	18
	(3)	4	9	15	16		(31)	3	4	19	24
	(4)	5	8	10	12		(32)	7	9	20	23
	(5)	6	7	22	27		(33)	8	17	26	28
	(6)	13	18	24	25		(34)	10	15	21	22
	(7)	14	17	19	21		(35)	11	14	25	27
II	(8)	1	2	24	27	VI	(36)	1	10	19	28
	(9)	3	12	21	28		(37)	2	3	22	25
	(10)	4	8	23	25		(38)	4	7	11	12
	(11)	5	7	13	17		(39)	5	9	24	26
	(12)	6	9	10	11		(40)	6	8	14	18
	(13)	14	16	22	26		(41)	13	16	20	21
	(14)	15	18	19	20		(42)	15	17	23	27
III	(15)	1	4	17	18	VII	(43)	1	7	14	15
	(16)	2	6	21	23		(44)	2	9	12	17
	(17)	3	5	11	15		(45)	3	8	20	27
	(18)	7	16	25	28		(46)	4	13	22	28
	(19)	8	9	19	22		(47)	5	6	19	25
	(20)	10	13	26	27		(48)	10	16	23	24
	(21)	12	14	20	24		(49)	11	18	21	26
IV	(22)	1	5	20	22	VIII	(50)	1	8	11	16
	(23)	2	4	10	14		(51)	2	7	19	26
	(24)	3	6	16	17		(52)	3	9	13	14
	(25)	7	8	21	24		(53)	4	5	21	27
	(26)	9	18	27	28		(54)	6	15	24	28
	(27)	11	13	19	23		(55)	10	17	20	25
	(28)	12	15	25	26		(56)	12	18	22	23

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>			
IX	(57)	1	9	21	25
	(58)	2	8	13	15
	(59)	3	7	10	18
	(60)	4	6	20	26
	(61)	5	14	23	28
	(62)	11	17	22	24
	(63)	12	16	19	27

29. k b v r λ
 5 6 6 5 4

Youden Square

<u>Blk.</u>	<u>Tr.</u>				
(1)	1	2	3	4	5
(2)	2	3	4	5	6
(3)	3	4	5	6	1
(4)	4	5	6	1	2
(5)	5	6	1	2	3
(6)	6	1	2	3	4

30. k b v r λ
 5 11 11 5 2

Youden Square

<u>Blk.</u>	<u>Tr.</u>				
(1)	1	5	6	7	9
(2)	2	8	7	6	10
(3)	3	6	10	11	1
(4)	4	7	11	1	2
(5)	5	11	4	8	6
(6)	6	9	3	2	4
(7)	7	4	5	10	3
(8)	8	1	2	3	5
(9)	9	10	1	4	8
(10)	10	2	9	5	11
(11)	11	3	8	9	7

31. k b v r λ
 5 18 9 10 5

2 groups; each contains 5 replications;
 Extended Youden Square.

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>				
I	(1)	1	2	3	7	8
	(2)	2	6	8	4	1
	(3)	3	8	5	9	2
	(4)	4	3	9	2	6
	(5)	5	1	7	3	4
	(6)	6	4	2	5	7
	(7)	7	9	1	6	3
	(8)	8	5	4	1	9
	(9)	9	7	6	8	5
II	(10)	1	2	3	5	9
	(11)	2	6	5	1	8
	(12)	3	5	1	4	6
	(13)	4	3	2	8	7
	(14)	5	7	9	2	4
	(15)	6	8	7	3	5
	(16)	7	4	8	9	1
	(17)	8	9	4	6	3
	(18)	9	1	6	7	2

32. k b v r λ
 5 18 10 9 4

<u>Blk.</u>			<u>Tr.</u>		
(1)	1	2	3	5	7
(2)	3	4	6	7	8
(3)	2	3	4	8	9
(4)	3	4	5	9	10
(5)	4	5	6	7	10
(6)	3	5	6	8	1
(7)	4	5	6	9	1
(8)	3	6	7	10	2
(9)	4	5	7	8	2
(10)	6	7	8	9	1
(11)	5	7	8	9	10
(12)	6	8	9	10	2
(13)	7	9	10	1	3
(14)	8	10	1	3	4
(15)	7	9	1	2	4
(16)	8	10	1	2	5
(17)	9	2	3	5	6
(18)	10	1	2	4	6

33. k b v r λ
 5 21 21 5 1

Youden Square

<u>Blk.</u>	<u>Tr.</u>				
(1)	1	2	3	4	17
(2)	2	5	15	19	12
(3)	3	13	12	6	21
(4)	4	7	13	10	19
(5)	5	8	6	17	7
(6)	6	19	1	11	16
(7)	7	21	16	2	9
(8)	8	16	18	12	4
(9)	9	18	5	13	1
(10)	10	12	17	9	11
(11)	11	4	21	5	14
(12)	12	14	7	1	20
(13)	13	11	8	20	2
(14)	14	6	2	18	10
(15)	15	17	14	16	13
(16)	16	10	20	3	5
(17)	17	20	19	21	18
(18)	18	15	11	7	3
(19)	19	3	9	14	8
(20)	20	9	4	15	6
(21)	21	1	10	8	15

34. k b v r λ
 5 30 25 6 1

6 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>				
I	(1)	1	2	3	4	5
	(2)	6	7	8	9	10
	(3)	11	12	13	14	15
	(4)	16	17	18	19	20
	(5)	21	22	23	24	25
II	(6)	1	6	11	16	21
	(7)	2	7	12	17	22
	(8)	3	8	13	18	23
	(9)	4	9	14	19	24
	(10)	5	10	15	20	25
III	(11)	1	10	14	18	22
	(12)	2	6	15	19	23
	(13)	3	7	11	20	24
	(14)	4	8	12	16	25
	(15)	5	9	13	17	21
IV	(16)	1	9	12	20	23
	(17)	2	10	13	16	24
	(18)	3	6	14	17	25
	(19)	4	7	15	18	21
	(20)	5	8	11	19	22
V	(21)	1	8	15	17	24
	(22)	2	9	11	18	25
	(23)	3	10	12	19	21
	(24)	4	6	13	20	22
	(25)	5	7	14	16	23
VI	(26)	1	7	13	19	25
	(27)	2	8	14	20	21
	(28)	3	9	15	16	22
	(29)	4	10	11	17	23
	(30)	5	6	12	18	24

35. k b v r λ
 5 82 41 10 1

2 groups; each contains 5 replications;
 Extended Youden Square

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>	<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>
(1)	1	10	(42)	1	19
(2)	2	11	(43)	2	20
(3)	3	12	(44)	3	21
(4)	4	13	(45)	4	22
(5)	5	14	(46)	5	23
(6)	6	15	(47)	6	24
(7)	7	16	(48)	7	25
(8)	8	17	(49)	8	26
(9)	9	18	(50)	9	27
(10)	10	19	(51)	10	28
(11)	11	20	(52)	11	29
(12)	12	21	(53)	12	30
(13)	13	22	(54)	13	31
(14)	14	23	(55)	14	32
(15)	15	24	(56)	15	33
(16)	16	25	(57)	16	34
(17)	17	26	(58)	17	35
(18)	18	27	(59)	18	36
(19)	19	28	(60)	19	37
(20)	20	29	(61)	20	38
(21)	21	30	(62)	21	39
(22)	22	31	(63)	22	40
(23)	23	32	(64)	23	41
(24)	24	33	(65)	24	1
(25)	25	34	(66)	25	2
(26)	26	35	(67)	26	3
(27)	27	36	(68)	27	4
(28)	28	37	(69)	28	5
(29)	29	38	(70)	29	6
(30)	30	39	(71)	30	7
(31)	31	40	(72)	31	8
(32)	32	41	(73)	32	9
(33)	33	1	(74)	33	10
(34)	34	2	(75)	34	11
(35)	35	3	(76)	35	12
(36)	36	4	(77)	36	13
(37)	37	5	(78)	37	14
(38)	38	6	(79)	38	15
(39)	39	7	(80)	39	16
(40)	40	8	(81)	40	17
(41)	41	9	(82)	41	18

I

II

36.	k	b	v	r	λ
	6	7	7	6	5

Youden Square

<u>Blk.</u>	<u>Tr.</u>					
(1)	1	2	3	4	5	6
(2)	2	3	4	5	6	7
(3)	3	4	5	6	7	1
(4)	4	5	6	7	1	2
(5)	5	6	7	1	2	3
(6)	6	7	1	2	3	4
(7)	7	1	2	3	4	5

CORRECTION

In the designs which are divided into groups, Roman numbers have been used to indicate the groups. The caption of this column has been mislabelled "Rep.," instead of the correct "Group." For example, the design with reference number 2, which has two groups, should appear as follows:

<u>Group</u>	<u>Blk.</u>	<u>Tr.</u>	
I	(1)	1	2
	(2)	2	5
	(3)	3	4
	(4)	4	1
	(5)	5	3
II	(6)	1	3
	(7)	2	4
	(8)	3	2
	(9)	4	5
	(10)	5	1

No confusion will arise by observing that such designs carry a brief description, in which the number of groups is specified.

Some other designs, such as the design with reference number 1, are divided into replications, and hence the caption "Rep." is correct for them.

37. k b v r λ
 6 11 11 6 3

Youden Square

<u>Blk.</u>	<u>Tr.</u>					
(1)	2	3	4	8	10	11
(2)	3	4	5	9	11	1
(3)	4	5	6	10	1	2
(4)	5	6	7	11	2	3
(5)	6	7	8	1	3	4
(6)	7	8	9	2	4	5
(7)	8	9	10	3	5	6
(8)	9	10	11	4	6	7
(9)	10	11	1	5	7	8
(10)	11	1	2	6	8	9
(11)	1	2	3	7	9	10

38. k b v r λ
 6 12 9 8 5

4 groups; each contains 2 replications,
 which are separable

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>					
I	(1)	1	2	3	7	8	9
	(2)	4	5	6	1	2	3
	(3)	7	8	9	4	5	6
II	(4)	1	4	7	2	5	8
	(5)	2	5	8	3	6	9
	(6)	3	6	9	1	4	7
III	(7)	1	6	8	3	5	7
	(8)	2	4	9	1	6	8
	(9)	3	5	7	2	4	9
IV	(10)	1	5	9	3	4	8
	(11)	2	6	7	1	5	9
	(12)	3	4	8	2	6	7

39. k b v r λ
 6 15 10 9 5

<u>Blk.</u>				<u>Tr.</u>		
(1)	3	4	6	7	9	10
(2)	2	4	5	7	8	10
(3)	2	3	5	6	8	9
(4)	1	4	6	7	8	9
(5)	1	5	7	8	9	10
(6)	1	2	5	6	9	10
(7)	3	5	6	7	8	10
(8)	2	3	4	8	9	10
(9)	1	3	4	5	9	10
(10)	1	2	4	6	8	10
(11)	1	2	3	7	8	9
(12)	1	2	3	6	7	10
(13)	1	2	3	4	5	7
(14)	1	3	4	5	6	8
(15)	2	4	5	6	7	9

40. k b v r λ
 6 16 16 6 2

Youden Square

<u>Blk.</u>	<u>Tr.</u>					
(1)	1	2	3	5	12	13
(2)	2	3	4	6	9	14
(3)	3	4	1	7	10	15
(4)	4	1	2	8	11	16
(5)	5	6	7	9	16	1
(6)	6	7	8	10	13	2
(7)	7	8	5	11	14	3
(8)	8	5	6	12	15	4
(9)	9	10	11	13	4	5
(10)	10	11	12	14	1	6
(11)	11	12	9	15	2	7
(12)	12	9	10	16	3	8
(13)	13	14	15	1	8	9
(14)	14	15	16	2	5	10
(15)	15	16	13	3	6	11
(16)	16	13	14	4	7	12

41.	k	b	v	r	λ
	6	24	16	9	3

3 groups; each contains 3 replications,
which are separable.

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>					
I	(1)	1	2	5	6	11	12
	(2)	3	4	7	8	9	10
	(3)	5	6	9	10	13	14
	(4)	7	8	11	12	15	16
	(5)	9	10	15	16	1	2
	(6)	11	12	13	14	3	4
	(7)	13	14	1	2	7	8
	(8)	15	16	3	4	5	6
II	(9)	1	3	6	8	13	15
	(10)	2	4	5	7	14	16
	(11)	5	7	13	15	9	11
	(12)	6	8	14	16	10	12
	(13)	9	11	2	4	6	8
	(14)	10	12	1	3	5	7
	(15)	13	15	10	12	2	4
	(16)	14	16	9	11	1	3
III	(17)	1	4	5	8	10	11
	(18)	2	3	6	7	9	12
	(19)	5	8	9	12	13	16
	(20)	6	7	13	16	1	4
	(21)	9	12	1	4	14	15
	(22)	10	11	14	15	6	7
	(23)	13	16	10	11	2	3
	(24)	14	15	2	3	5	8

42. k b v r λ
 6 31 31 6 1

Youden Square

<u>Blk.</u>	<u>Tr.</u>					
(1)	1	2	3	4	5	26
(2)	2	22	27	17	7	12
(3)	3	13	8	18	23	27
(4)	4	24	9	27	19	14
(5)	5	27	25	20	10	15
(6)	6	9	7	10	26	8
(7)	7	28	11	3	24	20
(8)	8	4	28	25	12	16
(9)	9	5	13	21	28	17
(10)	10	1	14	22	18	28
(11)	11	14	12	26	15	13
(12)	12	23	20	1	9	29
(13)	13	10	16	2	29	24
(14)	14	17	29	6	3	25
(15)	15	7	18	29	4	21
(16)	16	26	17	19	20	18
(17)	17	15	24	8	30	1
(18)	18	11	2	9	25	30
(19)	19	12	10	30	21	3
(20)	20	30	22	13	6	4
(21)	21	25	26	24	22	23
(22)	22	3	31	15	16	9
(23)	23	31	4	11	17	10
(24)	24	18	5	12	31	6
(25)	25	19	1	31	13	7
(26)	26	29	30	28	27	31
(27)	27	21	6	16	1	11
(28)	28	6	15	23	2	19
(29)	29	8	19	5	11	22
(30)	30	16	23	7	14	5
(31)	31	20	21	14	8	2

43. k b v r λ
 7 8 8 7 6

Youden Square

<u>Blk.</u>	<u>Tr.</u>						
(1)	1	2	3	4	5	6	7
(2)	2	3	4	5	6	7	8
(3)	3	4	5	6	7	8	1
(4)	4	5	6	7	8	1	2
(5)	5	6	7	8	1	2	3
(6)	6	7	8	1	2	3	4
(7)	7	8	1	2	3	4	5
(8)	8	1	2	3	4	5	6

- 44 -

44.	k	b	v	r	λ
	7	15	15	7	3

Youden Square

<u>Blk.</u>	<u>Tr.</u>						
(1)	1	2	3	5	6	9	11
(2)	2	3	4	6	7	10	12
(3)	3	4	5	7	8	11	13
(4)	4	5	6	8	9	12	14
(5)	5	6	7	9	10	13	15
(6)	6	7	8	10	11	14	1
(7)	7	8	9	11	12	15	2
(8)	8	9	10	12	13	1	3
(9)	9	10	11	13	14	2	4
(10)	10	11	12	14	15	3	5
(11)	11	12	13	15	1	4	6
(12)	12	13	14	1	2	5	7
(13)	13	14	15	2	3	6	8
(14)	14	15	1	3	4	7	9
(15)	15	1	2	4	5	8	10

45. k b v r λ
 7 30 21 10 3

<u>Blk.</u>				<u>Tr.</u>			
(1)	1	5	7	9	13	18	19
(2)	2	8	10	13	14	19	16
(3)	3	1	6	14	15	16	17
(4)	4	2	9	15	11	19	17
(5)	3	10	7	11	12	16	18
(6)	5	4	6	8	12	17	18
(7)	1	4	7	8	11	14	20
(8)	2	8	12	15	18	19	20
(9)	3	5	9	11	19	16	20
(10)	4	9	10	12	16	17	20
(11)	1	10	6	13	19	17	20
(12)	5	2	6	14	16	18	20
(13)	3	7	15	13	17	18	20
(14)	2	3	6	9	12	13	21
(15)	3	4	10	14	18	19	21
(16)	4	7	6	15	19	16	21
(17)	5	8	13	11	16	17	21
(18)	5	7	14	12	19	17	21
(19)	1	9	8	15	16	18	21
(20)	1	2	10	11	17	18	21
(21)	1	3	6	8	11	12	19
(22)	1	2	4	7	12	13	16
(23)	2	3	7	8	9	14	17
(24)	3	4	5	8	10	13	15
(25)	4	9	6	13	14	11	18
(26)	5	1	9	10	14	15	12
(27)	5	2	10	6	7	15	11
(28)	1	2	3	4	5	20	21
(29)	6	7	8	9	10	20	21
(30)	11	12	13	14	15	20	21

46.	k	b	v	r	λ		
	7	36	28	9	2		
Blk.			Tr.				
(1)	1	2	5	14	20	23	28
(2)	1	3	6	15	20	21	24
(3)	2	4	7	16	21	22	25
(4)	2	3	8	17	22	26	1
(5)	3	4	5	9	18	23	27
(6)	4	6	10	19	23	24	2
(7)	5	7	11	24	25	28	3
(8)	5	6	8	12	25	26	4
(9)	6	7	9	13	20	26	27
(10)	7	8	10	21	27	1	5
(11)	8	9	11	14	22	28	6
(12)	9	10	12	15	28	2	7
(13)	10	11	13	16	23	3	8
(14)	11	12	17	24	1	4	9
(15)	12	13	14	18	25	1	10
(16)	13	15	19	26	2	5	11
(17)	14	16	27	2	3	6	12
(18)	14	15	17	3	4	7	13
(19)	15	16	18	20	28	4	8
(20)	16	17	19	21	5	9	14
(21)	17	18	22	5	6	10	15
(22)	18	19	1	6	7	11	16
(23)	19	20	23	7	8	12	17
(24)	21	24	2	8	9	13	18
(25)	20	22	25	3	9	10	19
(26)	20	21	26	4	10	11	14
(27)	21	22	23	27	11	12	15
(28)	22	24	5	12	13	16	20
(29)	23	25	28	6	13	17	21
(30)	23	24	26	7	14	18	22
(31)	24	25	27	8	14	15	19
(32)	25	26	1	9	15	16	23
(33)	26	27	28	10	16	17	24
(34)	27	2	11	17	18	20	25
(35)	28	3	12	18	19	21	26
(36)	28	1	4	13	19	22	27

47. k b v r λ
 7 56 49 8 1

8 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>							<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>						
I	(1)	1	2	3	4	5	6	7	V	(29)	1	12	16	27	31	42	46
	(2)	8	9	10	11	12	13	14		(30)	2	13	17	28	32	36	47
	(3)	15	16	17	18	19	20	21		(31)	3	14	18	22	33	37	48
	(4)	22	23	24	25	26	27	28		(32)	4	8	19	23	34	38	49
	(5)	29	30	31	32	33	34	35		(33)	5	9	20	24	35	39	43
	(6)	36	37	38	39	40	41	42		(34)	6	10	21	25	29	40	44
	(7)	43	44	45	46	47	48	49		(35)	7	11	15	26	30	41	45
II	(8)	1	8	15	22	29	36	43	VI	(36)	1	11	21	24	34	37	47
	(9)	2	9	16	23	30	37	44		(37)	2	12	15	25	35	38	48
	(10)	3	10	17	24	31	38	45		(38)	3	13	16	26	29	39	49
	(11)	4	11	18	25	32	39	46		(39)	4	14	17	27	30	40	43
	(12)	5	12	19	26	33	40	47		(40)	5	8	18	28	31	41	44
	(13)	6	13	20	27	34	41	48		(41)	6	9	19	22	32	42	45
	(14)	7	14	21	28	35	42	49		(42)	7	10	20	23	33	36	46
III	(15)	1	14	20	26	32	38	44	VII	(43)	1	10	19	28	30	39	48
	(16)	2	8	21	27	33	39	45		(44)	2	11	20	22	31	40	49
	(17)	3	9	15	28	34	40	46		(45)	3	12	21	23	32	41	43
	(18)	4	10	16	22	35	41	47		(46)	4	13	15	24	33	42	44
	(19)	5	11	17	23	29	42	48		(47)	5	14	16	25	34	36	45
	(20)	6	12	18	24	30	36	49		(48)	6	8	17	26	35	37	46
	(21)	7	13	19	25	31	37	43		(49)	7	9	18	27	29	38	47
IV	(22)	1	13	18	23	35	40	45	VIII	(50)	1	9	17	25	33	41	49
	(23)	2	14	19	24	29	41	46		(51)	2	10	18	26	34	42	43
	(24)	3	8	20	25	30	42	47		(52)	3	11	19	27	35	36	44
	(25)	4	9	21	26	31	36	48		(53)	4	12	20	28	29	37	45
	(26)	5	10	15	27	32	37	49		(54)	5	13	21	22	30	38	45
	(27)	6	11	16	28	33	38	43		(55)	6	14	15	23	31	39	47
	(28)	7	12	17	22	34	39	44		(56)	7	8	16	24	32	40	48

48. k b v r λ
 8 9 9 8 7

Youden Square

<u>Blk.</u>								
	<u>Tr.</u>							
(1)	1	2	3	4	5	6	7	8
(2)	2	3	4	5	6	7	8	9
(3)	3	4	5	6	7	8	9	1
(4)	4	5	6	7	8	9	1	2
(5)	5	6	7	8	9	1	2	3
(6)	6	7	8	9	1	2	3	4
(7)	7	8	9	1	2	3	4	5
(8)	8	9	1	2	3	4	5	6
(9)	9	1	2	3	4	5	6	7

49. k b v r λ
 8 15 15 8 4

Youden Square

<u>Blk.</u>	<u>Tr.</u>							
(1)	4	7	8	10	12	13	14	15
(2)	5	8	9	11	13	14	15	1
(3)	6	9	10	12	14	15	1	2
(4)	7	10	11	13	15	1	2	3
(5)	8	11	12	14	1	2	3	4
(6)	9	12	13	15	2	3	4	5
(7)	10	13	14	1	3	4	5	6
(8)	11	14	15	2	4	5	6	7
(9)	12	15	1	3	5	6	7	8
(10)	13	1	2	4	6	7	8	9
(11)	14	2	3	5	7	8	9	10
(12)	15	3	4	6	8	9	10	11
(13)	1	4	5	7	9	10	11	12
(14)	2	5	6	8	10	11	12	13
(15)	3	6	7	9	11	12	13	14

50. k b v r λ
 8 57 57 8 1

Youden Square

Blk.

(1)	1	2	3	4	5	6	7	50
(2)	2	51	16	23	30	37	9	44
(3)	3	10	51	24	31	38	45	17
(4)	4	11	18	51	32	39	46	25
(5)	5	12	19	26	51	40	33	47
(6)	6	13	20	27	34	51	48	41
(7)	7	14	21	28	35	42	49	51
(8)	8	9	10	11	12	14	50	13
(9)	9	15	28	34	52	46	40	3
(10)	10	52	22	35	41	47	4	16
(11)	11	17	23	29	42	52	5	48
(12)	12	18	52	30	36	49	24	6
(13)	13	19	25	31	37	43	52	7
(14)	14	20	26	32	38	44	1	52
(15)	15	16	17	18	19	50	21	20
(16)	16	28	33	38	53	11	6	43
(17)	17	22	34	12	44	7	39	53
(18)	18	53	35	40	45	1	13	23
(19)	19	24	29	41	46	2	53	14
(20)	20	25	30	53	3	8	47	42
(21)	21	36	53	36	48	4	31	9
(22)	22	23	24	25	50	27	28	26
(23)	23	34	38	49	4	54	8	19
(24)	24	35	39	54	43	9	20	5
(25)	25	29	40	44	6	10	54	21
(26)	26	54	41	45	7	15	30	11
(27)	27	31	54	42	1	12	16	46
(28)	28	32	36	47	2	13	17	54
(29)	29	30	31	50	33	32	34	35

Blk.

(30)	30	40	43	55	14	17	27	4
(31)	31	41	44	5	8	18	55	28
(32)	32	42	55	6	9	19	22	45
(33)	33	36	46	7	55	20	23	10
(34)	34	55	47	1	11	21	37	24
(35)	35	38	48	2	15	55	25	12
(36)	36	37	50	39	40	41	42	38
(37)	37	46	6	8	17	26	35	56
(38)	38	47	7	9	18	56	29	27
(39)	39	48	1	19	10	28	56	30
(40)	40	49	2	56	20	22	11	31
(41)	41	56	12	43	21	23	3	32
(42)	42	44	4	13	56	24	15	33
(43)	43	50	45	46	47	48	44	49
(44)	44	3	11	57	27	35	19	36
(45)	45	4	57	20	28	29	12	37
(46)	46	5	13	21	57	30	38	22
(47)	47	6	14	15	23	31	57	39
(48)	48	7	8	16	24	57	32	40
(49)	49	1	9	17	25	33	41	57
(50)	50	57	56	52	54	53	51	55
(51)	51	8	15	22	29	36	43	1
(52)	52	21	27	33	39	45	2	8
(53)	53	27	32	37	49	5	10	15
(54)	54	33	37	48	22	3	14	18
(55)	55	39	49	3	13	16	26	29
(56)	56	45	5	14	16	25	36	34
(57)	57	43	42	10	26	34	18	2

51. k b v r λ
 8 72 64 9 1

9 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>								<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>							
I	(1)	1	2	3	4	5	6	7	8	V	(33)	1	15	21	27	40	42	52	62
	(2)	9	10	11	12	13	14	15	16		(34)	2	16	22	28	39	41	51	61
	(3)	17	18	19	20	21	22	23	24		(35)	3	13	23	25	38	44	50	64
	(4)	25	26	27	28	29	30	31	32		(36)	4	14	24	26	37	43	49	63
	(5)	33	34	35	36	37	38	39	40		(37)	5	11	17	31	36	46	56	58
	(6)	41	42	43	44	45	46	47	48		(38)	6	12	18	32	35	45	55	57
	(7)	49	50	51	52	53	54	55	56		(39)	7	9	19	29	34	48	54	60
	(8)	57	58	59	60	61	62	63	64		(40)	8	10	20	30	33	47	53	59
II	(9)	1	9	17	25	33	41	49	57	VI	(41)	1	16	23	26	36	45	54	59
	(10)	2	10	18	26	34	42	50	58		(42)	2	15	24	25	35	46	53	60
	(11)	3	11	19	27	35	43	51	59		(43)	3	14	21	28	34	47	56	57
	(12)	4	12	20	28	36	44	52	60		(44)	4	13	22	27	33	48	55	58
	(13)	5	13	21	29	37	45	53	61		(45)	5	12	19	30	40	41	50	63
	(14)	6	14	22	30	38	46	54	62		(46)	6	11	20	29	39	42	49	64
	(15)	7	15	23	31	39	47	55	63		(47)	7	10	17	32	38	43	52	61
	(16)	8	16	24	32	40	48	56	64		(48)	8	9	18	31	37	44	51	62
III	(17)	1	10	19	28	37	46	55	64	VII	(49)	1	12	24	29	38	47	51	58
	(18)	2	9	20	27	38	45	56	63		(50)	2	11	23	30	37	48	52	57
	(19)	3	12	17	26	39	48	53	62		(51)	3	10	22	31	40	45	49	60
	(20)	4	11	18	25	40	47	54	61		(52)	4	9	21	32	39	46	50	59
	(21)	5	14	23	32	33	42	51	60		(53)	5	16	20	25	34	43	55	62
	(22)	6	13	24	31	34	41	52	59		(54)	6	15	19	26	33	44	56	61
	(23)	7	16	21	30	35	44	49	58		(55)	7	14	18	27	36	41	53	64
	(24)	8	15	22	29	36	43	50	57		(56)	8	13	17	28	35	42	54	63
IV	(25)	1	13	18	30	39	43	56	60	VIII	(57)	1	14	20	31	35	48	50	61
	(26)	2	14	17	29	40	44	55	59		(58)	2	13	19	32	36	47	49	62
	(27)	3	15	20	32	37	41	54	58		(59)	3	16	18	29	33	46	52	63
	(28)	4	16	19	31	38	42	53	57		(60)	4	15	17	30	34	45	51	64
	(29)	5	9	22	26	35	47	52	64		(61)	5	10	24	27	39	44	54	57
	(30)	6	10	21	25	36	48	51	63		(62)	6	9	23	28	40	43	53	58
	(31)	7	11	24	28	33	45	50	62		(63)	7	12	22	25	37	42	56	59
	(32)	8	12	23	27	34	46	49	61		(64)	8	11	21	26	38	41	55	60

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>							
IX	(65)	1	11	22	32	34	44	53	63
	(66)	2	12	21	31	33	43	54	64
	(67)	3	9	24	30	36	42	55	61
	(68)	4	10	23	29	35	41	56	62
	(69)	5	15	18	28	38	48	49	59
	(70)	6	16	17	27	37	47	50	60
	(71)	7	13	20	26	40	46	51	57
	(72)	8	14	19	25	39	45	52	58

52.	k	b	v	r	λ
	9	10	10	9	8

Youden Square

<u>Blk.</u>	<u>Tr.</u>								
(1)	1	2	3	4	5	6	7	8	9
(2)	2	3	4	5	6	7	8	9	10
(3)	3	4	5	6	7	8	9	10	1
(4)	4	5	6	7	8	9	10	1	2
(5)	5	6	7	8	9	10	1	2	3
(6)	6	7	8	9	10	1	2	3	4
(7)	7	8	9	10	1	2	3	4	5
(8)	8	9	10	1	2	3	4	5	6
(9)	9	10	1	2	3	4	5	6	7
(10)	10	1	2	3	4	5	6	7	8

53. k b v r λ
 9 13 13 9 6

Youden Square

<u>Blk.</u>	<u>Tr.</u>											
(1)	1	3	4	5	8	9	10	11	12			
(2)	2	7	1	11	12	8	9	13	3			
(3)	3	5	2	12	13	6	11	1	4			
(4)	4	6	13	9	11	7	8	12	5			
(5)	5	11	12	10	6	1	2	9	7			
(6)	6	9	5	13	2	10	12	3	8			
(7)	7	10	6	1	3	12	13	4	9			
(8)	8	12	7	2	4	13	1	5	10			
(9)	9	8	3	7	1	5	4	2	6			
(10)	10	13	9	4	5	2	3	7	11			
(11)	11	1	10	6	7	3	5	8	13			
(12)	12	4	8	3	10	11	7	6	2			
(13)	13	2	11	8	9	4	6	10	1			

54. k b v r λ
 9 19 19 9 4

Youden Square

<u>Blk.</u>	<u>Tr.</u>									
(1)	1	3	5	6	7	8	11	14	15	
(2)	2	4	6	7	8	9	12	15	16	
(3)	3	5	7	8	9	10	13	16	17	
(4)	4	6	8	9	10	11	14	17	18	
(5)	5	7	9	10	11	12	15	18	19	
(6)	6	8	10	11	12	13	16	19	1	
(7)	7	9	11	12	13	14	17	1	2	
(8)	8	10	12	13	14	15	18	2	3	
(9)	9	11	13	14	15	16	19	3	4	
(10)	10	12	14	15	16	17	1	4	5	
(11)	11	13	15	16	17	18	2	5	6	
(12)	12	14	16	17	18	19	3	6	7	
(13)	13	15	17	18	19	1	4	7	8	
(14)	14	16	18	19	1	2	5	8	9	
(15)	15	17	19	1	2	3	6	9	10	
(16)	16	18	1	2	3	4	7	10	11	
(17)	17	19	2	3	4	5	8	11	12	
(18)	18	1	3	4	5	6	9	12	13	
(19)	19	2	4	5	6	7	10	13	14	

55. k b v r λ
 9 25 25 9 3

Youden Square

<u>Blk.</u>	<u>Tr.</u>								
(1)	1	2	3	4	5	6	7	8	9
(2)	2	4	9	10	24	17	15	22	12
(3)	3	24	8	23	18	21	13	4	10
(4)	4	22	25	8	20	12	11	3	19
(5)	5	15	17	18	8	11	2	13	20
(6)	6	8	12	13	1	14	24	25	15
(7)	7	16	5	22	3	10	25	15	13
(8)	8	10	11	16	6	22	23	1	17
(9)	9	13	20	5	12	23	1	21	22
(10)	10	19	14	12	16	2	8	5	21
(11)	11	18	19	24	10	1	5	9	25
(12)	12	6	10	25	7	18	20	2	23
(13)	13	11	4	9	23	25	14	16	2
(14)	14	3	7	17	11	5	12	23	24
(15)	15	20	21	1	14	7	10	11	4
(16)	16	17	18	7	13	19	4	12	1
(17)	17	14	13	20	19	3	9	10	6
(18)	18	9	22	14	25	8	21	17	7
(19)	19	7	23	15	9	20	16	24	8
(20)	20	5	16	6	4	24	22	14	18
(21)	21	12	6	11	15	9	3	18	16
(22)	22	21	24	19	2	13	6	7	11
(23)	23	1	2	3	22	15	18	19	14
(24)	24	25	1	2	21	16	17	20	3
(25)	25	23	15	21	17	4	19	6	5

56. k b v r λ
 9 37 37 9 2

Youden Square

<u>Blk.</u>	<u>Tr.</u>								
(1)	1	2	4	8	18	25	26	30	36
(2)	2	3	5	9	19	26	27	31	37
(3)	3	4	6	10	20	27	28	32	1
(4)	4	5	7	11	21	28	29	33	2
(5)	5	6	8	12	22	29	30	34	3
(6)	6	7	9	13	23	30	31	35	4
(7)	7	8	10	14	24	31	32	36	5
(8)	8	9	11	15	25	32	33	37	6
(9)	9	10	12	16	26	33	34	1	7
(10)	10	11	13	17	27	34	35	2	8
(11)	11	12	14	18	28	35	36	3	9
(12)	12	13	15	19	29	36	37	4	10
(13)	13	14	16	20	30	37	1	5	11
(14)	14	15	17	21	31	1	2	6	12
(15)	15	16	18	22	32	2	3	7	13
(16)	16	17	19	23	33	3	4	8	14
(17)	17	18	20	24	34	4	5	9	15
(18)	18	19	21	25	35	5	6	10	16
(19)	19	20	22	26	36	6	7	11	17
(20)	20	21	23	27	37	7	8	12	18
(21)	21	22	24	28	1	8	9	13	19
(22)	22	23	25	29	2	9	10	14	20
(23)	23	24	26	30	3	10	11	15	21
(24)	24	25	27	31	4	11	12	16	22
(25)	25	26	28	32	5	12	13	17	23
(26)	26	27	29	33	6	13	14	18	24
(27)	27	28	30	34	7	14	15	19	25
(28)	28	29	31	35	8	15	16	20	26
(29)	29	30	32	36	9	16	17	21	27
(30)	30	31	33	37	10	17	18	22	28
(31)	31	32	34	1	11	18	19	23	29
(32)	32	33	35	2	12	19	20	24	30
(33)	33	34	36	3	13	20	21	25	31
(34)	34	35	37	4	14	21	22	26	32
(35)	35	36	1	5	15	22	23	27	33
(36)	36	37	2	6	16	23	24	28	34
(37)	37	1	3	7	17	24	25	29	35

57. k b v r λ
 9 73 73 9 1

Youden Square

<u>Blk.</u>	<u>Tr.</u>									
(1)	1	2	3	4	5	6	7	8	65	
(2)	2	66	18	26	34	42	50	10	58	
(3)	3	11	66	27	35	19	51	43	59	
(4)	4	12	20	66	36	44	52	28	60	
(5)	5	13	21	29	37	45	53	61	66	
(6)	6	14	22	30	38	66	54	62	46	
(7)	7	15	23	31	39	47	66	63	55	
(8)	8	16	24	32	40	48	56	66	64	
(9)	9	10	11	12	13	65	16	14	15	
(10)	10	19	28	1	46	55	67	64	37	
(11)	11	67	25	40	47	54	18	4	61	
(12)	12	17	67	39	48	53	26	3	62	
(13)	13	24	31	34	41	52	59	6	67	
(14)	14	23	32	33	42	51	60	67	5	
(15)	15	22	29	67	43	50	57	36	8	
(16)	16	21	30	35	67	49	58	44	7	
(17)	17	18	19	20	21	22	65	23	24	
(18)	18	30	68	43	56	60	1	39	13	
(19)	19	31	38	42	68	57	4	53	16	
(20)	20	32	37	41	54	58	68	15	3	
(21)	21	25	36	68	51	63	6	48	10	
(22)	22	68	26	47	52	64	5	35	9	
(23)	23	27	34	46	49	61	8	68	12	
(24)	24	28	33	45	50	68	62	7	11	
(25)	25	26	27	28	29	30	31	65	32	
(26)	26	37	69	49	63	43	14	24	4	
(27)	27	40	42	69	62	1	15	52	21	
(28)	28	39	41	51	69	2	61	16	22	
(29)	29	69	48	54	60	7	9	19	34	
(30)	30	33	47	53	59	8	10	20	69	
(31)	31	36	46	56	58	5	11	69	17	
(32)	32	35	45	55	57	69	12	18	6	
(33)	33	34	35	36	65	38	39	37	40	
(34)	34	47	57	14	3	70	21	56	28	
(35)	35	46	53	70	2	15	23	60	25	
(36)	36	45	54	59	1	16	23	70	26	
(37)	37	44	51	62	8	31	70	9	18	

57. (Cont'd)

<u>Blk.</u>					<u>Tr.</u>				
(38)	38	43	52	61	7	10	17	32	70
(39)	39	70	49	64	6	11	20	42	29
(40)	40	41	5	63	70	12	19	50	30
(41)	41	42	43	65	44	46	47	45	48
(42)	42	54	63	8	71	17	28	13	35
(43)	43	55	62	5	16	20	25	34	71
(44)	44	56	61	6	15	26	71	33	19
(45)	45	49	60	3	10	71	22	40	31
(46)	46	71	50	21	9	4	32	59	39
(47)	47	51	58	71	12	24	29	1	38
(48)	48	52	71	37	11	23	30	2	57
(49)	49	50	65	52	53	56	55	54	51
(50)	50	61	1	48	20	14	35	31	72
(51)	51	64	4	15	17	72	34	30	45
(52)	52	63	72	16	18	29	3	46	33
(53)	53	58	6	9	23	28	40	72	43
(54)	54	57	39	10	24	27	72	5	44
(55)	55	60	8	11	72	21	38	26	41
(56)	56	59	7	72	22	25	37	12	42
(57)	57	65	59	60	61	62	65	58	63
(58)	58	8	14	19	25	39	45	73	52
(59)	59	5	15	18	28	73	48	38	49
(60)	60	6	16	17	27	37	73	47	50
(61)	61	3	9	24	30	36	42	55	73
(62)	62	4	10	23	73	35	41	29	56
(63)	63	1	73	22	32	34	44	11	53
(64)	64	73	12	2	31	33	43	21	54
(65)	65	72	70	73	66	67	69	71	68
(66)	66	9	17	25	33	41	49	57	1
(67)	67	20	56	38	45	9	63	27	2
(68)	68	29	40	44	55	59	2	17	14
(69)	69	38	44	50	64	3	13	25	23
(70)	70	48	55	58	4	13	33	22	27
(71)	71	53	64	7	14	18	27	41	36
(72)	72	62	2	13	19	32	36	49	47
(73)	73	7	13	57	26	40	46	51	20

58. k b v r λ
 9 90 81 10 1

10 Replications

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>								
I	(1)	1	2	3	4	5	6	7	8	9
	(2)	10	11	12	13	14	15	16	17	18
	(3)	19	20	21	22	23	24	25	26	27
	(4)	28	29	30	31	32	33	34	35	36
	(5)	37	38	39	40	41	42	43	44	45
	(6)	46	47	48	49	50	51	52	53	54
	(7)	55	56	57	58	59	60	61	62	63
	(8)	64	65	66	67	68	69	70	71	72
	(9)	73	74	75	76	77	78	79	80	81
II	(10)	1	10	19	28	37	46	55	64	73
	(11)	2	11	20	29	38	47	56	65	74
	(12)	3	12	21	30	39	48	57	66	75
	(13)	4	13	22	31	40	49	58	67	76
	(14)	5	14	23	32	41	50	59	68	77
	(15)	6	15	24	33	42	51	60	69	78
	(16)	7	16	25	34	43	52	61	70	79
	(17)	8	17	26	35	44	53	62	71	80
	(18)	9	18	27	36	45	54	63	72	81
III	(19)	1	12	20	34	45	53	58	69	77
	(20)	2	10	21	35	43	54	59	67	78
	(21)	3	11	19	36	44	52	60	68	76
	(22)	4	15	23	28	39	47	61	72	80
	(23)	5	13	24	29	37	48	62	70	81
	(24)	6	14	22	30	38	46	63	71	79
	(25)	7	18	26	31	42	50	55	66	74
	(26)	8	16	27	32	40	51	56	64	75
	(27)	9	17	25	33	41	49	57	65	73
IV	(28)	1	13	25	30	42	54	56	68	80
	(29)	2	14	26	28	40	52	57	69	81
	(30)	3	15	27	29	41	53	55	67	79
	(31)	4	16	19	33	45	48	59	71	74
	(32)	5	17	20	31	43	46	60	72	75
	(33)	6	18	21	32	44	47	58	70	73
	(34)	7	10	22	36	39	51	62	65	77
	(35)	8	11	23	34	37	49	63	66	78
	(36)	9	12	24	35	38	50	61	64	76

58. (Cont'd)

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>								
V	(37)	1	14	27	35	39	49	60	70	74
	(38)	2	15	25	36	37	50	58	71	75
	(39)	3	13	26	34	38	51	59	72	73
	(40)	4	17	21	29	42	52	63	64	77
	(41)	5	18	19	30	40	53	61	65	78
	(42)	6	16	20	28	41	54	62	66	76
	(43)	7	11	24	32	45	46	57	67	80
	(44)	8	12	22	33	43	47	55	68	81
	(45)	9	10	23	31	44	48	56	69	79
VI	(46)	1	15	26	32	43	48	63	65	76
	(47)	2	13	27	33	44	46	61	66	77
	(48)	3	14	25	31	45	47	62	64	78
	(49)	4	18	20	35	37	51	57	68	79
	(50)	5	16	21	36	38	49	55	69	80
	(51)	6	17	19	34	39	50	56	67	81
	(52)	7	12	23	29	40	54	60	71	73
	(53)	8	10	24	30	41	52	58	72	74
	(54)	9	11	22	28	42	53	59	70	75
VII	(55)	1	11	21	31	41	51	61	71	81
	(56)	2	12	19	32	42	49	62	72	79
	(57)	3	10	20	33	40	50	63	70	80
	(58)	4	14	24	34	44	54	55	65	75
	(59)	5	15	22	35	45	52	56	66	73
	(60)	6	13	23	36	43	53	57	64	74
	(61)	7	17	27	28	38	48	58	68	78
	(62)	8	18	25	29	39	46	59	69	76
	(63)	9	16	26	30	37	47	60	67	77
VIII	(64)	1	16	22	29	44	50	57	72	78
	(65)	2	17	23	30	45	51	55	70	76
	(66)	3	18	24	28	43	49	56	71	77
	(67)	4	10	25	32	38	53	60	66	81
	(68)	5	11	26	33	39	54	58	64	79
	(69)	6	12	27	31	37	52	59	65	80
	(70)	7	13	19	35	41	47	63	69	75
	(71)	8	14	20	36	42	48	61	67	73
	(72)	9	15	21	34	40	46	62	68	74

58 . (Cont'd)

<u>Rep.</u>	<u>Blk.</u>	<u>Tr.</u>								
IX	(73)	1	18	23	33	38	52	62	67	75
	(74)	2	16	24	31	39	53	63	68	73
	(75)	3	17	22	32	37	54	61	69	74
	(76)	4	12	26	36	41	46	56	70	78
	(77)	5	10	27	34	42	47	57	71	76
	(78)	6	11	25	35	40	48	55	72	77
	(79)	7	15	20	30	44	49	59	64	81
	(80)	8	13	21	28	45	50	60	65	79
	(81)	9	14	19	29	43	51	58	66	80
X	(82)	1	17	24	36	40	47	59	66	79
	(83)	2	18	22	34	41	48	60	64	80
	(84)	3	16	23	35	42	46	58	65	81
	(85)	4	11	27	30	43	50	62	69	73
	(86)	5	12	25	28	44	51	63	67	74
	(87)	6	10	26	29	45	49	61	68	75
	(88)	7	14	21	33	37	53	56	72	76
	(89)	8	15	19	31	38	54	57	70	77
	(90)	9	13	20	32	39	52	55	71	78

59. k b v r λ
 10 11 11 10 9

Youden Square

<u>Blk.</u>	<u>Tr.</u>									
(1)	1	2	3	4	5	6	7	8	9	10
(2)	2	3	4	5	6	7	8	9	10	11
(3)	3	4	5	6	7	8	9	10	11	1
(4)	4	5	6	7	8	9	10	11	1	2
(5)	5	6	7	8	9	10	11	1	2	3
(6)	6	7	8	9	10	11	1	2	3	4
(7)	7	8	9	10	11	1	2	3	4	5
(8)	8	9	10	11	1	2	3	4	5	6
(9)	9	10	11	1	2	3	4	5	6	7
(10)	10	11	1	2	3	4	5	6	7	8
(11)	11	1	2	3	4	5	6	7	8	9

60.	k	b	v	r	λ
	10	16	16	10	6

Youden Square

<u>Blk.</u>	<u>Tr.</u>									
(1)	1	3	4	6	7	8	9	11	12	13
(2)	2	4	5	7	8	9	10	12	1	14
(3)	3	5	6	8	9	10	11	1	2	15
(4)	4	6	7	9	10	11	12	14	15	16
(5)	5	7	8	10	11	12	13	15	16	1
(6)	6	8	9	11	12	13	14	16	5	2
(7)	7	9	10	12	13	14	15	5	6	3
(8)	8	10	11	13	14	15	12	2	3	4
(9)	9	11	12	14	15	16	1	3	4	5
(10)	10	12	13	15	16	1	2	4	9	6
(11)	11	13	14	16	1	2	3	9	10	7
(12)	12	14	15	1	2	3	16	6	7	8
(13)	13	15	16	2	3	4	5	7	8	9
(14)	14	16	1	3	4	5	6	8	13	10
(15)	15	1	2	4	5	6	7	13	14	11
(16)	16	2	3	5	6	7	4	10	11	12

61.	k	b	v	r	λ
	10	19	19	10	5

Youden Square

<u>Blk.</u>	<u>Tr.</u>									
(1)	1	3	8	9	11	12	15	16	17	18
(2)	2	4	9	10	12	13	16	17	18	19
(3)	3	5	10	11	13	14	17	18	19	1
(4)	4	6	11	12	14	15	18	19	1	2
(5)	5	7	12	13	15	16	19	1	2	3
(6)	6	8	13	14	16	17	1	2	3	4
(7)	7	9	14	15	17	18	2	3	4	5
(8)	8	10	15	16	18	19	3	4	5	6
(9)	9	11	16	17	19	1	4	5	6	7
(10)	10	12	17	18	1	2	5	6	7	8
(11)	11	13	18	19	2	3	6	7	8	9
(12)	12	14	19	1	3	4	7	8	9	10
(13)	13	15	1	2	4	5	8	9	10	11
(14)	14	16	2	3	5	6	9	10	11	12
(15)	15	17	3	4	6	7	10	11	12	13
(16)	16	18	4	5	7	8	11	12	13	14
(17)	17	19	5	6	8	9	12	13	14	15
(18)	18	1	6	7	9	10	13	14	15	16
(19)	19	2	7	8	10	11	14	15	16	17

62. k b v r λ
 10 31 31 10 3

Youden Square

Blk.

Tr.

(1)	1	2	4	8	9	11	15	16	18	28
(2)	2	3	12	9	10	17	16	19	5	22
(3)	3	4	20	10	17	13	6	18	11	23
(4)	4	5	7	11	12	21	18	14	19	24
(5)	5	6	1	12	13	8	19	20	15	25
(6)	6	7	13	16	14	9	20	21	2	26
(7)	7	1	15	14	8	10	21	17	3	27
(8)	8	11	17	25	16	23	29	7	26	5
(9)	9	12	24	29	27	18	1	26	17	6
(10)	10	13	18	19	29	25	2	27	28	7
(11)	11	14	22	26	19	20	3	28	29	1
(12)	12	8	27	23	20	29	4	22	21	2
(13)	13	9	29	28	21	15	5	23	24	3
(14)	14	10	25	22	15	16	24	29	6	4
(15)	15	24	26	5	2	27	11	10	30	20
(16)	16	25	6	30	3	28	12	11	27	21
(17)	17	26	28	7	30	22	13	12	4	15
(18)	18	27	23	1	5	30	14	13	22	16
(19)	19	28	30	2	6	14	8	24	23	17
(20)	20	22	8	3	7	24	9	30	25	18
(21)	21	23	10	4	1	26	30	25	9	19
(22)	22	21	11	17	24	1	25	2	31	13
(23)	23	15	3	18	25	2	26	31	12	14
(24)	24	16	19	31	26	3	27	4	13	8
(25)	25	17	14	27	31	4	28	5	20	9
(26)	26	18	5	21	28	31	22	6	8	10
(27)	27	19	31	15	22	6	23	9	7	11
(28)	28	20	16	24	23	7	31	1	10	12
(29)	29	30	2	6	4	5	7	3	1	31
(30)	30	31	9	13	11	12	10	8	14	29
(31)	31	29	21	20	18	19	17	15	16	30

63. k b v r λ
 10 91 91 10 1

Youden Square

<u>Blk.</u>	<u>Tr.</u>									
(1)	1	2	7	11	24	27	35	42	54	56
(2)	2	3	8	12	25	28	36	43	55	57
(3)	3	4	9	13	26	29	37	44	56	58
(4)	4	5	10	14	27	30	38	45	57	59
(5)	5	6	11	15	28	31	39	46	58	60
(6)	6	7	12	16	29	32	40	47	59	61
(7)	7	8	13	17	30	33	41	48	60	62
(8)	8	9	14	18	31	34	42	49	61	63
(9)	9	10	15	19	32	35	43	50	62	64
(10)	10	11	16	20	33	36	44	51	63	65
(11)	11	12	17	21	34	37	45	52	64	66
(12)	12	13	18	22	35	38	46	53	65	67
(13)	13	14	19	23	36	39	47	54	66	68
(14)	14	15	20	24	37	40	48	55	67	69
(15)	15	16	21	25	38	41	49	56	68	70
(16)	16	17	22	26	39	42	50	57	69	71
(17)	17	18	23	27	40	43	51	58	70	72
(18)	18	19	24	28	41	44	52	59	71	73
(19)	19	20	25	29	42	45	53	60	72	74
(20)	20	21	26	30	43	46	54	61	73	75
(21)	21	22	27	31	44	47	55	62	74	76
(22)	22	23	28	32	45	48	56	63	75	77
(23)	23	24	29	33	46	49	57	64	76	78
(24)	24	25	30	34	47	50	58	65	77	79
(25)	25	26	31	35	48	51	59	66	78	80
(26)	26	27	32	36	49	52	60	67	79	81
(27)	27	28	33	37	50	53	61	68	80	82
(28)	28	29	34	38	51	54	62	69	81	83
(29)	29	30	35	39	52	55	63	70	82	84
(30)	30	31	36	40	53	56	64	71	83	85
(31)	31	32	37	41	54	57	65	72	84	86
(32)	32	33	38	42	55	58	66	73	85	87
(33)	33	34	39	43	56	59	67	74	86	88
(34)	34	35	40	44	57	60	68	75	87	89
(35)	35	36	41	45	58	61	69	76	88	90
(36)	36	37	42	46	59	62	70	77	89	91
(37)	37	38	43	47	60	63	71	78	90	1
(38)	38	39	44	48	61	64	72	79	91	2
(39)	39	40	45	49	62	65	73	80	1	3
(40)	40	41	46	50	63	66	74	81	2	4
(41)	41	42	47	51	64	67	75	82	3	5
(42)	42	43	48	52	65	69	76	83	4	6
(43)	43	44	49	53	66	69	77	84	5	7

63. (Cont'd)

<u>Blk.</u>	<u>Tr.</u>									
(44)	44	45	50	54	67	70	78	85	6	8
(45)	45	46	51	55	68	71	79	86	7	9
(46)	46	47	52	56	69	72	80	87	8	10
(47)	47	48	53	57	70	73	81	88	9	11
(48)	48	49	54	58	71	74	82	89	10	12
(49)	49	50	55	59	72	75	83	90	11	13
(50)	50	51	56	60	73	76	84	91	12	14
(51)	51	52	57	61	74	77	85	1	13	15
(52)	52	53	58	62	75	78	86	2	14	16
(53)	53	54	59	63	76	79	87	3	15	17
(54)	54	55	60	64	77	80	88	4	16	18
(55)	55	56	61	65	78	81	89	5	17	19
(56)	56	57	62	66	79	82	90	6	18	20
(57)	57	58	63	67	80	83	91	7	19	21
(58)	58	59	64	68	81	84	1	8	20	22
(59)	59	60	65	69	82	85	2	9	21	23
(60)	60	61	66	70	83	86	3	10	22	24
(61)	61	62	67	71	84	87	4	11	23	25
(62)	62	63	68	72	85	88	5	12	24	26
(63)	63	64	69	73	86	89	6	13	25	27
(64)	64	65	70	74	87	90	7	14	26	28
(65)	65	66	71	75	88	91	8	15	27	29
(66)	66	67	72	76	89	1	9	16	28	30
(67)	67	68	73	77	90	2	10	17	29	31
(68)	68	69	74	78	91	3	11	18	30	32
(69)	69	70	75	79	1	4	12	19	31	33
(70)	70	71	76	80	2	5	13	20	32	34
(71)	71	72	77	81	3	6	14	21	33	35
(72)	72	73	78	82	4	7	15	22	34	36
(73)	73	74	79	83	5	8	16	23	35	37
(74)	74	75	80	84	6	9	17	24	36	38
(75)	75	76	81	85	7	10	18	25	37	39
(76)	76	77	82	86	8	11	19	26	38	40
(77)	77	78	83	87	9	12	20	27	39	41
(78)	78	79	84	88	10	13	21	28	40	42
(79)	79	80	85	89	11	14	22	29	41	43
(80)	80	81	86	90	12	15	23	30	42	44
(81)	81	82	87	91	13	16	24	31	43	45
(82)	82	83	88	1	14	17	25	32	44	46
(83)	83	84	89	2	15	18	26	33	45	47
(84)	84	85	90	3	16	19	27	34	46	48
(85)	85	86	91	4	17	20	28	35	47	49
(86)	86	87	1	5	18	21	29	36	48	50
(87)	87	88	2	6	19	22	30	37	49	51
(88)	88	89	3	7	20	23	31	38	50	52
(89)	89	90	4	8	21	24	32	39	51	53
(90)	90	91	5	9	22	25	33	40	52	54
(91)	91	1	6	10	23	26	34	41	53	55

INDEX BY NUMBER OF UNITS IN A BLOCK

Reference number	(k)	(b)	(v)	(r)	(λ)	Remarks
1	2	6	4	3	1	R
2	2	10	5	4	1	2G:2;E.Y.S.
3	2	15	6	5	1	R
4	2	21	7	6	1	3G:2;E.Y.S.
5	2	28	8	7	1	R
6	2	36	9	8	1	4G:2;E.Y.S.
7	2	45	10	9	1	R
8	2	55	11	10	1	5G:2;E.Y.S.
9	3	4	4	3	2	Y.S.
10	3	7	7	3	1	Y.S.
11	3	10	5	6	3	2G:3;E.Y.S.
12	3	10	6	5	2	
13	3	12	9	4	1	R
14	3	26	13	6	1	2G:3;E.Y.S.
15	3	30	10	9	2	3G:3;E.Y.S.
16	3	35	15	7	1	R
17	3	57	19	9	1	3G:3;E.Y.S.
18	3	70	21	10	1	R
19	4	5	5	4	3	Y.S.
20	4	7	7	4	2	Y.S.
21	4	13	13	4	1	Y.S.
22	4	14	8	7	3	R
23	4	15	6	10	6	5G:2
24	4	15	10	6	2	
25	4	18	9	8	3	2G:4;E.Y.S.
26	4	20	16	5	1	R
27	4	50	25	8	1	2G:4;E.Y.S.
28	4	63	28	9	1	R
29	5	6	6	5	4	Y.S.
30	5	11	11	5	2	Y.S.
31	5	18	9	10	5	2G:5;E.Y.S.
32	5	18	10	9	4	
	5	21	15	7	2	
33	5	21	21	5	1	Y.S.
34	5	30	25	6	1	R
35	5	82	41	10	1	2G:5;E.Y.S.
36	6	7	7	6	5	Y.S.
37	6	11	11	6	3	Y.S.
38	6	12	9	8	5	4G:2
39	6	15	10	9	5	
40	6	16	16	6	2	Y.S.
41	6	24	16	9	3	3G:3
	6	28	21	8	2	

INDEX (Cont'd)

Reference number	(k)	(b)	(v)	(r)	(λ)	Remarks
42	6	31	31	6	1	Y.S.
	6	69	46	9	1	
	6	85	51	10	1	
43	7	8	8	7	6	Y.S.
44	7	15	15	7	3	Y.S.
	7	22	22	7	2	
45	7	30	21	10	3	
46	7	36	28	9	2	
47	7	56	49	8	1	R
48	8	9	9	8	7	Y.S.
49	8	15	15	8	4	Y.S.
	8	29	29	8	2	
	8	45	36	10	2	
50	8	57	57	8	1	Y.S.
51	8	72	64	9	1	R
52	9	10	10	9	8	Y.S.
53	9	13	13	9	6	Y.S.
54	9	19	19	9	4	Y.S.
55	9	25	25	9	3	Y.S.
56	9	37	37	9	2	Y.S.
57	9	73	73	9	1	Y.S.
58	9	90	81	10	1	R
59	10	11	11	10	9	Y.S.
60	10	16	16	10	6	Y.S.
61	10	19	19	10	5	Y.S.
62	10	31	31	10	3	Y.S.
	10	46	46	10	2	
63	10	91	91	10	1	Y.S.



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